

**Industry Canada Consultation on
Developing a Digital Research Infrastructure Strategy**

**Response from Dr. Catherine Middleton,
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Thank you for initiating this consultation on the development of a digital research infrastructure strategy for Canada. As detailed below, my comments focus on the value of defining digital research infrastructure broadly, and call for provision of infrastructure to support everyday research activities as well as to support advanced research and innovation activities.

I hold the Canada Research Chair in Communication Technologies in the Information Society at Ryerson University. My area of research expertise is the development of broadband and mobile infrastructure, and my PhD is in Management Information Systems. My research on communications infrastructure has been funded by Infrastructure Canada, SSHRC, the Networks of Centres of Excellence (through the GRAND NCE) and the Australian Research Council. I have managed my own research grants, participated in research partnerships (funded by SSHRC Partnership and Partnership Development grants) and participated in the leadership of the GRAND NCE (as a member of the Research Management Committee). Additionally, I have reviewed many grant applications for SSHRC, and reviewed Canada Research Chair (CRC) applications as a member of the CRC College of Reviewers and the Interdisciplinary Adjudication Committee so am familiar with research approaches, programs and workflows across a variety of disciplines. I am a member of the boards of directors of CANARIE and Compute Ontario, attended the 2014 Digital Infrastructure Summit, and co-authored a 2015 recommendation on developing data management plans in the social sciences and humanities (Sapach, Rockwell, & Middleton, 2015).

My comments are informed by these experiences as an infrastructure researcher, a research team leader/manager, a peer reviewer, and as an observer of the development of Canada's digital research infrastructure. The views expressed here are my own, and do not represent any of the organizations with which I am affiliated.

- 1. Digital Research Infrastructure should be widely available to provide support for *all* research activities. A Digital Research Infrastructure strategy should recognize the importance of, and ensure the provision of digital infrastructure for advanced *and* everyday research activities.**

As described by Industry Canada, Digital Research Infrastructure (DRI) “refers to the elements required to perform data-intensive and computationally-intensive research and data management, including high-performance computing, storage, high-speed networks and other tools and resources, including software, standards and data management services.” The document continues, noting that “Today, DRI underpins world-class research

across all disciplines” (Industry Canada, 2015, p. 3). This second statement offers a much broader perspective on the importance of digital research infrastructure, as the underpinning, or foundation, of research excellence.

I believe it is necessary to recognize that DRI supports much more than “advanced research and innovation,” and to develop a strategy for DRI in Canada to ensure that *all* researchers in Canada have access to the digital data, analytical tools, computing power and network capacity needed to advance their research. In addition to much needed support for high performance computing, advanced networking, and development of tools to analyze and archive complex data sets, digital research infrastructure is also needed to manage researchers’ everyday activities. It is required to analyze data sets of all types and sizes, not just big data. It is needed to facilitate everyday collaboration among research teams within Canada and internationally, allowing sharing of large and small files, sharing generic and specialized software, and enabling simple tasks like multi-person video conferencing and document and data management. It is needed to disseminate research findings to a wide variety of audiences, including other academics, policy makers, and the general public.

2. DRI strategy development should explicitly explore opportunities for more efficient delivery of everyday digital research infrastructure.

My intent in drawing attention to the importance of everyday research infrastructure is to ensure that it is considered in strategic planning of the digital research infrastructure environment. In the past, this everyday infrastructure has been provided by research institutions, but as research becomes more dependent on specialized digital infrastructure there is value in considering opportunities to develop common tools and to investigate changes to procurement, funding and delivery approaches. The strategic planning process should explore efficient mechanisms to develop and provide everyday research infrastructure, for instance addressing questions as to how/whether cloud-based approaches can efficiently deliver services to researchers on a large scale. Questions as to how such everyday infrastructure is most efficiently funded, and by whom (e.g. research institutions, granting councils, governments, industry) are also within the scope of the strategic planning process.

3. DRI strategy development should be informed by a strong understanding of research workflows, and of the wide variety of digital tools and services that can facilitate research activities.

The consultation document notes that “Understanding the requirements of Canada’s research community, and tapping into their knowledge and expertise in identifying opportunities and challenges, is the starting point in developing a DRI strategy that will produce tangible benefits for Canadians” (Industry Canada, 2015, p. 4). While much work has been done in the past few years to understand and address Canada’s digital research infrastructure needs, the focus has been on advanced DRI. I recommend that the strategy development process that will follow this consultation engage with researchers to develop an understanding of how everyday digital infrastructure can improve research workflows

(i.e. the activities undertaken at each stage of the research process), recognizing the variety inherent in multiple approaches to research methods and in collecting, managing and analyzing different types of data. Questions to be answered include: at what points in the research workflow can/should digital tools support and facilitate research? what tools already exist? are researchers aware of them and using them? if not, what are the barriers to use? how can existing tools be enhanced to better support research needs? what are the generic requirements of various research workflows that can be supported by standardized tools and services, and in what instances are specific tools or services really necessary? when specific tools are needed, what support is available to develop such tools for re-use?

4. DRI strategy development should recognize and respond to the opportunity to help researchers benefit from more extensive use of digital research infrastructure.

Many researchers are unfamiliar with, or even unaware of, digital tools that can facilitate their research workflows. It is likely that research funds are being spent developing tools and services that are already available, either because researchers are unaware of where to find the tools/services that meet their needs, or because they do not recognize that existing tools can support their requirements. There is work being done to encourage development of common digital research tools/services and to encourage re-use, but these efforts can be bolstered by additional outreach to researchers, institutions and funding agencies to demonstrate the value of this digital infrastructure. As with digital tools in general, digital literacy is required to ensure that users get full value from adopting digital research infrastructure, and to allow them to modify and adapt tools to best support and advance their own research activities. Activities to promote awareness of everyday digital research infrastructure, and to train researchers to use it, should be incorporated into Canada's DRI strategy.

I would be happy to provide additional information regarding these comments or to answer questions on these recommendations.

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References

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